STUDY OF AIRPOWER

UNIVERSITY
OF MICHIGAN

JUL 27 1956

MAIN
READING ROOM

HEARING

BEFORE THE

SUBCOMMITTEE ON THE AIR FORCE

OF THE

COMMITTEE ON ARMED SERVICES

UNITED STATES SENATE

EIGHTY-FOURTH CONGRESS

SECOND SESSION

AIRPOWER

JUNE 20, 1956

PART XIV

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NOTE.—Throughout the text, topic headings have been inserted to facilitate reference. These topic headings are not part of the testimony per se.

STUDY OF AIRPOWER

WEDNESDAY, JUNE 20, 1956

UNITED STATES SENATE,
SUBCOMMITTEE ON THE AIR FORCE,
OF THE COMMITTEE ON ARMED SERVICES,
Washington, D. C.

The subcommittee (consisting of Senators Symington, Jackson, Ervin, Saltonstall, and Duff) met, pursuant to recess, at 10:10 a. m., in room 457, Senate Office Building, Senator Stuart Symington (chairman of the subcommittee) presiding.

Present: Senators Symington, Saltonstall, and Duff.

Also present: Fowler Hamilton, general counsel; Ramsay D. Potts, Jr., associate general counsel; Fred B. Rhodes, legal consultant to Senator Saltonstall; Edward C. Welsh, assistant to Senator Symington; and Wallace L. Engle, staff member; Mansfield Sprague, General Counsel, Department of Defense; Lt. Col. D. S. Bussey, ODCSOPS, DA; Capt. S. S. Searcy, United States Navy, Assistant Director, Program Analysis Group; Col. M. E. Hubbard, Headquarters, United States Air Force; Col. J. W. Carpenter, Chief, Plans and Programs, Air Research and Development Center; Col. J. J. Cody, Deputy Weapons Systems, Air Research and Development Command; Lt. Col. S. E. Ernst, Headquarters, Air Research and Development Command; Lt. Col. F. W. Siever, Headquarters, Air Research and Development Command; Lt. Col. B. L. Boatman, Western Development Division; Lt. Col. T. A. Ahola, Western Development Division; Dr. T. G. Belden, Headquarters, Air Research and Development Command; Lt. Charles Cahn, II, Headquarters, Air Research and Development Command; Maj. M. L. Speer, Headquarters, Air Research and Development Command; 2d Lt. R. W. Nolf, Headquarters, Air Research and Development Command; M. Sgt. J. F. Byrd, Headquarters, Air Research and Development Command; T. Sgt. S. Mihalis, Headquarters, Air Research and Development Command; Clarke A. Morgan and Bernard Bogdanowicz, Office of Secretary of Defense, Security Office.

[The closed session testimony was censored by the Department of Defense for security reasons.

Those portions of the record affected by this censorship are indicated by the symbol Ⓓ.]

Senator SYMINGTON. We will call together this meeting of the Subcommittee on the Air Force of the Senate Armed Services Committee.

General Power, we welcome you here with us today. We would like to have your record included in the hearing at this point.

LT. GEN. THOMAS S. POWER, UNITED STATES AIR FORCE

Thomas Sarsfield Power was born in New York City on June 18, 1905. Entering the service as a flying cadet on February 17, 1928, he attended Air Corps Primary and Advanced Flying Schools and was commissioned a second lieutenant in the Air Corps Reserve on February 28, 1929.

Commissioned a second lieutenant in the Regular Army on September 4, 1929, General Power was assigned to Langley Field, Va. In September 1931 he entered the Air Corps Technical School at Chanute Field, Ill., and upon completion of the maintenance engineer course the following June, returned to Langley Field.

In May 1933 General Power became commanding officer of the 118th Company of the Civilian Conservation Corps at Annette State Forest Camp, N. H. From February to May 1934 he was Army air mail operations pilot of the eastern zone, with station at Bolling Field, Washington, D. C.

General Power returned to Langley Field in May 1934 as an instrument flying instructor, then commanding officer of the Second Wing headquarters detachment, and later intelligence and operations officer of the 20th Bomb Squadron there. He was assigned to the 28th Bomb Squad at Nichols Field, Rizal, Philippine Islands, from February 1936 to May 1938.

Going to Randolph Field, Texas, General Power was a flying instructor and assistant flight commander at the Primary Flying School. He attended the Air Corps Tactical School at Maxwell Field, Ala., from April 1940 to July 1941, and then was assigned as assistant A–3 officer of the West Coast Air Corps Training Center at Moffett Field, Calif. Transferring to Army Air Force Flying Training Command headquarters at Fort Worth, Tex., in July 1942, General Power served as air inspector, training and inspection officer, and later assistant chief of staff there.

In September 1943, General Power joined the 58th Bomb Wing at Salina Field, Kans., as deputy commander and then assistant chief of staff for operations of the Second Air Force at Colorado Springs, Colo. He was assigned in the North African Theater as deputy commander of the 304th Bomb Wing in January 1944, and that August was placed in command of the 314th Bomb Wing (very heavy), which moved to Guam that December and became part of the 21st Bomb Command.

Joining the United States Strategic Air Forces in the Pacific on August 1, 1945, General Power was assigned as A–3 during the atomic bomb attacks on Hiroshima and Nagasaki. He acted as assistant deputy task force commander during the Operation Crossroads atomic bomb tests at Bikini Atoll.

Moving to the Army Air Force Headquarters in August 1946, General Power was named Deputy Assistant Chief of Air Staff for Operations. In November 1947 he became chief of the Training Division in the office of the Deputy Chief of Staff for Operations at Air Force Headquarters. General Power went to London, England, as air attache, in June 1948.

Transferring to the Strategic Air Command 4 months later, he was assigned to SAC headquarters at Andrews Air Force Base, Md., moving with SAC headquarters to Offutt Air Force Base, Nebr., in November 1948, as deputy commander.

In May 1954 General Power assumed command of the Air Research and Development Command at Baltimore, Md.

His decorations include the Distinguished Service Medal, Silver Star, Legion of Merit, Distinguished Flying Cross, Bronze Star Medal, and Air Medal with one oak leaf cluster. He is rated a command pilot and aircraft observer.

PROMOTIONS

He was promoted to first lieutenant (permanent) March 30, 1935; to captain (temporary) April 20, 1935; to captain (permanent) September 4, 1939; to major (temporary) March 15, 1941; to lieutenant colonel (temporary) January 5, 1942; to colonel (temporary) June 26, 1943; to brigadier general (temporary) January 22, 1945; to major (permanent) September 4, 1946; to colonel (permanent) April 2, 1948; to major general (temporary) December 21, 1948; to brigadier general (permanent) January 27, 1950; to major general (permanent) October 9, 1951; to lieutenant general (temporary) April 15, 1954.

Senator SYMINGTON. It is customary in these hearings to ask all witnesses you may call on to testify to rise and be sworn at this time.

Is there anybody else besides yourself?

General POWER. General Schriever.

Senator SYMINGTON. Gentlemen, do you solemnly swear that the information you give this Subcommittee on the Air Force of the Senate Armed Services Committee will be the truth, the whole truth, and nothing but the truth so help you God?

General POWER. I do.

General SCHRIEVER. I do.

Senator SYMINGTON. General Power, have you a prepared statement?

TESTIMONY OF LT. GEN. T. S. POWER, COMMANDER, AIR RESEARCH AND DEVELOPMENT COMMAND, UNITED STATES AIR FORCE

General POWER. No, sir, I have a short briefing which will show our ICBM–IRBM program.

Mr. HAMILTON. Pardon me, if I may ask just one question for procedure.

General, are these gentlemen who are seated back at the table all members of your staff, including the civilians?

General POWER. Yes, sir.

Mr. HAMILTON. They have all been cleared for top secret?

General POWER. Yes, sir.

Mr. HAMILTON. To any degree of clearance that is needed for your presentation?

General POWER. Yes, sir.

Senator SYMINGTON. Will you proceed?

ORGANIZATION OF AIR RESEARCH AND DEVELOPMENT COMMAND

General POWER. Before introducing General Schriever, I thought it would be helpful to the committee if I gave you a thumbnail sketch of the command, with particular emphasis on where WDD fits into the overall structure.

Mr. HAMILTON. WDD being for the record what?

General POWER. The Western Development Division. The Air Research and Development Command is one of 17 major commands of the Air Force such as the Air Training Command, Strategic Air Command, Tactical Air Command, Continental Air Command, and this is the Air Research and Development Command.

The command was created approximately 6 years ago in order to provide the Air Force with a unique management tool to insure a coordinated and cohesive air research and development effort.

The headquarters of the Air Research and Development Command, located in Baltimore, Md., operates a complex of 10 research, development and test centers located throughout the United States, as shown on this chart.

The Air Force Missile Test Center at Patrick Air Force Base, Fla.; the Air Force Special Weapons Center in Albuquerque, N. Mex.; Air Force Flight Test Center in Edwards, Calif.; Air Force Cambridge Research Center outside of Boston; Air Force Armament Test Center, Eglin Air Force Base, Fla.; Wright Air Development Center, Dayton, Ohio; Air Force Personnel and Training Research Center, San Antonio, Texas.

We also operate the Armed Services Technical Information Agency and I will explain a little more about that later.

The Holloman Air Development Center, which is located in New Mexico; the Rome Air Development Center, Rome, N. Y.; the Arnold Engineering Development Center, Tullahoma, Tenn.; the Air Force Office of Scientific Research now located in Baltimore, but moving to Washington on July 1, and we also run an office in Brussels, Belgium.

Now the office in Brussels, Belgium, is designed to tap the scientific potential of free Europe on an unclassified basis. The Office of Scientific Research is designed to maintain contact with the scientific community of this Nation. This will give you a brief idea of where these various centers are located.

Senator SALTONSTALL. What is that next to the last one at the end of the page, General Power?

General POWER. That is the Office of Scientific Research, an organization which we formed. It is similar to a center, and is designed to maintain contact with the scientific community of this country.

Senator SALTONSTALL. So you have got that here and the Brussels one abroad?

General POWER. And the Brussels one abroad.

MISSION AND OPERATION OF ARDC

The mission of the command in a simple statement is to achieve and maintain qualitative superiority for the Air Force. It consists of approximately 40,000 personnel, half civilian and half military.

Briefly, we operate as follows: The major combat commands such as TAC, SAC, and Air Defense Command write requirements for new weapons systems.

These requirements are passed to headquarters USAF where they are validated and formalized by the Deputy Chief of Staff for Development, General Putt.

They are then issued as guide lines to the Air Research and Development Command to help us in running our research and development effort.

We do about 80 percent of our work by contract with 1,400 contractors and roughly 200 universities, colleges, and nonprofit institutions.

We do approximately 20 percent of our research and development effort "inhouse," in our various laboratories, by our people and in our facilites.

WESTERN DEVELOPMENT DIVISION

Now the one organization I have not mentioned as yet is the Western Development Division. This organization is located in Los Angeles, Calif. It is a part of my headquarters. It is commanded by Major General Schriever, who is also assistant commander to me, and it is charged with the intercontinental ballistic missile and the IRBM programs.

General Schriever as my deputy has authority to direct all of these centers, and all of these centers in one form or another participate in both the ICBM and the IRBM programs.

With this background I will now pass it over to General Schriever, who will enlarge on our operating philosophy and some of our problems of operating, and then we will show a motion picture which was taken in April.

It shows you the hardware. It is approximately 3 months old now. It is narrated by Dr. Ramo on an informal basis but I think it will give you an excellent picture of our progress to date and some of our problems.

General Schriever?

TESTIMONY OF MAJ. GEN. B. A. SCHRIEVER, COMMANDER, WESTERN DEVELOPMENT DIVISION

General SCHRIEVER. I have been in the ballistic missile program now for approximately 2 years.

I would like to cover some of the highlights over that period of time and, as General Power indicated, show what we call a progress report film which has a running time of about 25 minutes.

To begin with, I would like to review a little of the history in the pre-thermonuclear period in so far as it relates to the ICBM program.

Mr. HAMILTON. General, I don't wish to interrupt your presentation, but I wonder if you can either by statement now, or by supplying a statement, give something of your own background before you came into the missile picture?

AUTOBIOGRAPHICAL SKETCH

General SCHRIEVER. I could do it now if you would like.

I have been in the research and development activity since 1939 when I was stationed at Wright Field.

During the war I was overseas. I was not in R. & D. during that period. I was overseas for almost 3½ years. I came back in 1946 and was assigned to the Engineering Division in Headquarters, Air Corps. I stayed there for 3½ years in several different jobs, but primarily in R and D policy and planning. I attended the National War College and after graduation I was assigned back to the Pentagon. I was the Chief of the Development Planning Office which was originally called an assistant for evaluation.

I was assigned to that office for almost 4 years. I started in an active way in the ballistic missile program in April–May of 1954, and in June was actually assigned to the new job and left my duties in the Pentagon.

Mr. HAMILTON. Thank you, sir.

General SCHRIEVER. Academically I attended Texas A and M and later acquired a master's degree at Stanford University in mechancial engineering.

MISSILE STUDY PROGRAM

In 1946 the Air Force initiated a study program with Convair. The study program continued through 1952. There was certain experimental work accomplished during that period. It was canceled at one time, and Convair carried on the program with their own funds.

Mr. HAMILTON. That time was 1947?

General SCHRIEVER. That was when it was canceled in 1947, yes, and that was the period in which Convair continued. As I said, during that period the program was study and experimental. There were good reasons for this, primarily because of atomic weapon technology.

EARLY LIMITATIONS

First the low yield weapons did not promise that an ICBM would be a particularly useful military weapon.

Secondly, to compensate for the low yield, high accuracies required demanded guidance systems which were simply not within our technological capability.

Thirdly, the weight of our atomic weapons in that period of time would have demanded very, very large and expensive, and probably unreliable missiles.

These reasons argued very strongly against an all-out hardware development program. (D)

SIGNIFICANT CHANGES IN DEVELOPMENT PICTURE

In 1952 and 1953 the thermonuclear breakthrough changed the picture considerably.

There were two really significant events. The first one was the "Mike" shot, which proved the thermonuclear principle in November of 1952, and the second was a report submitted to the Air Force by the Nuclear Weapons Panel of the Scientific Advisory Board.

Dr. Von Neumann was chairman of this particular panel. The significant thing in the report is that it projected weapon technology into the future. (D)

This is what changed the picture. It gave promise of taking care of what you might term the deficiencies of the ICBM in the atomic weapon age by giving military worth and reducing the accuracy requirement, thereby making it technically feasible to develop a guidance system and to cut down the overall weight, making it then within manageable proportions both from a weight and a cost standpoint. This is the background through the summer of 1953.

BACKGROUND OF AF BALLISTIC MISSILE PROGRAM

1942: First ballistic missile flight, German V–2
1944–45:
  6,000 V–2's produced
  3,600 V–2's launched at Allied targets
1946: AF project MX–774 study contract (Convair)
1947: Economy review—MX–774 canceled
1951:
  AF project MX–1593 second study contract (Convair)
  ICBM program initiated (Convair Atlas)
1952: Atlas component program—seven-engine design with 5,000-pound warhead
1952–53: Thermonuclear breakthrough
1953: Air Force established Strategic Missiles Evaluation Committee—Dr. Von Neumann, Chairman

ACTION AND ACCOMPLISHMENT

In about September of 1953, Mr. Gardner, who was Assistant Secretary of the Air Force for R. and D., established at the Department of Defense level, to review all missiles, a Strategic Missiles Evaluation

Committee to investigate the implications of the thermonuclear breakthrough, and the military implications on our strategic missiles, particularly on the ICBM.

Dr. Von Neumann was the Chairman of that Committee.

This Committee submitted its recommendations to the Air Force in February of 1954.

Briefly, the recommendations were to establish a development-management group with unusual competence and authority to reorient and accelerate the program. This was to be accomplished after a comprehensive systems analysis and technical study period.

The Air Force took certain immediate action. (D)

This was done actually under the direction of Headquarters, USAF, and started in February and carried on through the remainder of the year.

Other things that were accomplished; in March, acceleration was directed by the Secretary; and in May, the program was assigned the highest program priority in the Air Force, not just 1–A research priority, but the highest program priority in the Air Force.

In June, after there had been a great deal of study within the air staff on the development-management organization——

Senator SALTONSTALL. General, with the chairman's permission, may I interrupt you there?

QUESTION OF PRIORITIES

What is the distinction between the highest research priority and the highest research program priority?

I don't quite understand.

General SCHRIEVER. Well, in the research and development program we have a series of projects, and these projects are given priorities.

The Air Force as a whole has a number of other things that it does, and this is the overall Air Force program. This particular research and development project was given the highest overall Air Force program priority.

Senator SYMINGTON. Not only the highest in research and development but the highest of anything anywhere?

General SCHRIEVER. This is correct; yes, sir.

Senator SALTONSTALL. Thank you, sir.

CREATION OF WESTERN DEVELOPMENT DIVISION

General SCHRIEVER. Going back to June here, after the air staff had made rather intensive study with the help—continued help of the von Neumann committee and other individuals outside the Air Force who were consultants to the Air Force, it was decided that the responsibility for the program should be assigned to the Air Research and Development Command, and they were directed to establish a field office which had overall responsibility—complete responsibility and authority for the program.

This was in June. General Power was in command of ARDC and in early July actually an ARDC directive had been prepared—an operations order, establishing the type of organization within ARDC to run the program.

This organization was the Western Development Division. By August the 15th, the Western Development Division (I was in command of the division at that time) assumed complete responsibility and authority over the program.

(The following is a chart regarding the establishment of the Western Development Division.)

ESTABLISHMENT OF WESTERN DEVELOPMENT DIVISION, 1954

February:
Strategic Missiles Evaluation Committee recommendations:
Modify warhead weight, CEP, impact velocity.
Establish Development-Management Group with unusual competence and authority to reorient and accelerate the program
March: ICBM acceleration directed by Secretary of Air Force
May: ICBM assigned highest program priority in Air Force
June: Air Research and Development Command directed to establish field office
August:
Western Development Division assumes responsibility
Special Aircraft Project Office (AMC)—contractual matters
Ramo-Wooldridge Corp.—weapons system engineering and technical direction

Now I would like to go into a little more detail of the organizational structure that we have on the west coast.

First, as General Power mentioned, it is located in Los Angeles. The field office actually consists of three elements. They operate as an integrated team.

The Western Development Division runs the entire program.

The Ballistic Missiles Office, of which General Funk is in charge, is the AMC office there. They do all of the contracting work for the ballistic missile program.

And the Ramo-Wooldridge organization, specifically the Guided Missiles Research Division, works full time on this program. It has systems engineering responsibility and technically directs all of the contractors in the program.

I would like to talk a little bit more about each one of these elements.

First the Western Development Division. As General Power mentioned, I have a second hat. I am also assistant to General Power with the authority of a deputy, as it pertains to all ballistic missile matters.

This does certain things for me from the standpoint of directive authority. First of all I have a channel, a direct channel, into the air staff. Secondly, the ARDC staff in Baltimore is at my disposal and I have directive authority over all the centers in the program.

I might mention there are 10 centers, and they all have a very active part in this program. As a matter of fact, if they were not in existence, we would not have a program.

The second point with respect to my relationship with General Power, he permits me to run with the ball, and I do run with it. As a matter of fact, if I did not, I probably would not still be on the job under General Power.

Secondly, he gives me complete support, personal support whenever I need it, and I have needed it on numerous occasions, particularly early last year, in getting on with the program with some of our problems in the Pentagon.

I might say that the strength of our organization, at the present time, is 155 officers, and about 120 civilians.

Out of this officer group—they are very highly qualified—I have some 50 officers who have Ph. D.'s and master's degrees. This gives you some idea of the capability and competence of the technical staff.

BALLISTIC MISSILE OFFICE

Now the Ballistic Missile Office. General Funk also wears a second hat. He is an assistant to General Rawlings and as such has direct access to all of the Air Materiel Command staff in support of our program, and he has directive authority over the air material areas as they relate to the ballistic missile program.

And as I have pointed out, his office writes all of the contracts for the ballistic missile program on the spot in Los Angeles. He has a great deal of flexibility.

In other words, we initiated the whole program on a letter contract basis so there would not be any delay in getting things underway.

Now one other point. He has special plant representatives who answer to him in all the contractors' plants that are in our program.

A word now about the Ramo-Wooldridge Corp., the Guided Missiles Research Division.

Senator SYMINGTON. General, may I ask a question for clarification?

General SCHRIEVER. Yes, sir.

Senator SYMINGTON. General Funk, does he report to you or does he report to General Rawlings, or does he wear a split hat?

As I understand it he is your logistics deputy as far as the contract application is concerned.

General SCHRIEVER. That is true.

Senator SYMINGTON. Please talk a little about his authority.

General SCHRIEVER. He is a Deputy Director of Procurement and Production of AMC. I do not have command jurisdiction over him, but in the manner in which we operate and in the matter of executive responsibility arrangement between AMC and ARDC he, for all practical purposes, works for me and it actually works out that way in our organization on the west coast.

We have staff meetings. He is right there.

In other words, it is an integrated staff arrangement. I have seen staffs under one commander who had a lot more difficulty than we have.

Senator SYMINGTON. I understand.

GUIDED MISSILES RESEARCH DIVISION

General SCHRIEVER. Now the Ramo-Wooldridge Corp., the Guided Missiles Research Division—and incidentally they operate in the same manner.

Dr. Ramo for example sits in on my staff meetings with respect to the overall mangement of the program—they are in a line capacity, having systems engineering responsibility and technical direction of the program.

They have an outstanding technical and scientific staff. They have some 650 individuals who are working full time on the program. Of this number as of the moment there are 286 that are in the scientific and senior engineering category. About 150 of these have Ph. D.'s and master's degrees and they are about equally divided.

In addition to that, there are some 89 consultants, and these people, many of them spend the full summer on consultant status with RW. Some of the leading scientists in the country are on this consultant group.

We have had a very fine response from the universities, particularly in getting consultant help for our program right from the very start.

Now I would like to talk a little bit about industry because that completes our overall team.

RELATIONSHIP WITH PRIVATE INDUSTRY

We consider this a team effort, a team effort of industry, science, and the military. In the industrial organization which we have supporting the program, we have some 20 which we consider major contractors. There are some 65 total contracts in our overall program at the present time, which includes the IRBM.

Many of these are the study and support of developing techniques and concepts for operational use and so on, but we have some 65 contracts, 20 of them major.

These contractors were arrived at by a selective competition. I will not run down the list of the contracts now because they appear in the film report, but we feel that we have assembled the strongest industrial team that is possible to get together in support of this program.

This was one of our original objectives, to get an outstanding industrial team to support it. Without it, why we just could not do the job. At the present time our major contractors, the strength, the personnel working on the program, is just over 20,000.

I don't have the total subcontractor strength at the present time, but this has been going up very rapidly.

It has been increasing, the number of personnel has been increasing at something like around 1,500 to 2,000 people a month in building up the program.

Now what I have discussed up to this point has been largely generated within the Air Force. There were certain actions taken in 1955 which had an impact on our program. I think all of you gentlemen are familiar with these actions, so I will simply indicate what my opinion is as to the impact of these particular actions on our program.

ICBM PRIORITY

First of all, in September we received the highest national priority in the country, that is the ICBM R and D program received the highest national priority by Presidential action.

This has been very helpful to us in our program in getting support that was a little bit hard to put your finger on before.

PROCEDURE AND COMMITTEES

Secondly, in November the Department of Defense issued a so-called simplified procedure and established the Ballistic Missiles Committees; these have been a big improvement from a procedural standpoint over the normal Pentagon operation in arriving at decisions.

We did have quite a few problems in getting decisions made, primarily in the area of facilities, during the early part of the program, mostly in the first 6 months of 1955.

ONLY AIR FORCE HAS ICBM PROGRAM

Senator SALTONSTALL. General, may I ask you this: When you use the word "we," do you refer to the Air Force alone, or do you refer to the way you are working with the Navy?

When you use the term "we," you mean the Air Force alone?

General SCHRIEVER. I mean the Air Force alone because the Air Force alone was actually in this ballistic missile program. I don't mean to discount the Army's Redstone program. I am talking only about the longer range ballistic missile programs. Only the Air Force was in the program at that time.

Senator SALTONSTALL. At that time?

General SCHRIEVER. At that time, yes, sir.

Now I am going to cover some of the other actions.

Senator SYMINGTON. To be clear on that point, the ICBM, nobody has an ICBM except the Air Force?

General SCHRIEVER. The Air Force is the only agency that is conducting an ICBM program.

It was in November of 1955 that we were directed to initiate the IRBM program on a high priority, and the Air Force IRBM program was integrated into the existing ICBM program. (D)

INITIATION OF IRBM PROGRAMS

I have been unable to put my finger on anything tangible that I could say has created an adverse effect on our ICBM time schedule by the introduction of the IRBM program.

Now at the same time in November the Army-Navy program was brought into being, the IRBM program, which is the intermediate range 1,500-mile ballistic missile.

Mr. HAMILTON. What time was that, for the record, General?

General SCHRIEVER. It was directed in November.

Mr. HAMILTON. Of 1955?

General SCHRIEVER. Of 1955.

Now here I can say that there has been a very substantial increase in workload on my top people with respect to coordination problems, with both the Army and the Navy concerning our IRBM and ICBM program and their IRBM program. It would be difficult for me, however, to put my finger on anything that would say that it has had an adverse effect on our time schedules. It just takes up hours of time of important people.

I think these were the major things that happened in 1955 that had an influence on our programs.

I would like to now briefly discuss our development program and schedule leading up to an operational capability which in the final analysis, is our primary objective, and that is an operational capability.

Before I do this, I would like to just flip through a couple of charts to give you an idea of what the configurations of the missiles that we have in our program look like, and some of the differences.

ATLAS ICBM MISSILE

The first one here is the one that has been in the program the longest. This is called the Atlas.

This is the Convair development program. (D)

COMPETITION

I would like to point out that our philosophy in the program has been competition in two senses: competition among contractors and competitive technical approaches. We feel that this will get us there sooner, better, cheaper and will also provide us a technical backup in case one of these things should fall on its face, which is always a possibility.

TITAN ICBM MISSILE

Senator SALTONSTALL. This is called the Martin project?

General SCHRIEVER. This is the Martin, yes.

Senator SALTONSTALL. What is the name?

General SCHRIEVER. Titan, this is the Titan. The Convair is the Atlas, and the next one here, which I will show you——

Senator SALTONSTALL. Before you leave that one, when did you start the Martin project?

General SCHRIEVER. To the best of my recollection at the moment, the contract was let in October of 1955.

Senator SYMINGTON. October 1955?

General SCHRIEVER. Yes, sir.

Senator SYMINGTON. And was the reason for that new ideas which justified, in your opinion, the new approach?

General SCHRIEVER. At the end of our technical studies and systems analyses, we felt very strongly that a second configuration made a lot of sense.

We believed, in about February of last year, and made certain recommendations that we probably should proceed with an alternate configuration. The Scientific Advisory Committee felt the same way, and these recommendations were made and then we started the process of getting competition going and so on. It was October before we actually could let the contract. (D)

I might point out here, then, that the Martin-Titan schedule is approximately 1 year behind in reaching major milestones as compared to the Convair program.

THOR IRBM PROGRAM

This chart shows the IRBM or Thor. Douglas is the airframe contractor. (D)

PLANNED PRODUCTION SCHEDULES

Now I would like to next cover very briefly the schedules, because there is where of course a great many detailed, integrated decisions and actions occur.

We have prepared some charts here which give you a test schedule and also a production schedule of the various missiles that we have in the program.

First this chart. I will explain the chart.

The left here, that indicates the rate of production of vehicles of all types. It includes test vehicles as well as all others for the program.

Mr. HAMILTON. That is the rate per fiscal year?

General SCHRIEVER. That is the rate per month.

This goes out across the top by calendar years. (D)

Now on the bottom here, this is for the Atlas program, Convair, I have indicated certain key points on our schedule. (D)

Now based on this development schedule, after careful study, these areas indicate when we feel that we can make designer leases for production prototype. (D)

Now there is a similar chart for the Martin. I won't go through that one unless you want to see it.

Senator SYMINGTON. We might like to see that, General, but first I would like to ask this question:

You say your first production prototype. (D)

In other words, is it the first actual effective missile?

General SCHRIEVER. No, sir. We are firing complete missiles in this time period here. These are development missiles. (D)

Of course we are producing—I will show you the total that we produce so they are not exactly handmade in the sense of an airplane but they are development missiles and for development purposes. (D)

TIGHT BUT REALISTIC PROGRAM

Senator SALTONSTALL. Mr. Chairman, may I ask one question?

Senator SYMINGTON. I wish you would, and I wish that Senator Duff would too, because we are moving very fast in this excellent briefing.

Senator SALTONSTALL. May I ask just this one question, General?

Is this schedule that you have shown us based upon optimism, so to speak, or have you got some practical basis to show that you are going to reach these points at the times that you state?

General SCHRIEVER. We feel that it is a highly compressed development schedule, one that has never been achieved as far as I know since I have been in the development business for such a complicated weapon of this type.

On the other hand, the basis on which it is being carried on, we have a very high degree of confidence that we will achieve these schedules.

We have the top technical people of the Nation look at these. They feel this is a realistic schedule. We are actually meeting our milestones. We have met our milestones. (D) We think this is an extremely tight schedule, but we have a great deal of confidence.

Senator SALTONSTALL. That is a very interesting statement.

Senator SYMINGTON. Senator Duff?

Senator DUFF. That is the question I was going to ask.

It is not merely expectation, it is confidence in the program?

General SCHRIEVER. We have a great deal of confidence, and this is not sales talk either because our particular management organization does not have a thing to gain by putting on a sales talk.

We are not selling anything. We are just trying to get this program accomplished. Ramo-Wooldridge, for example, which provides the technical direction, is not involved in any of the hardware, so they

are not trying to get in production any sooner just to get more money in the till.

We think this is realistic, but it is really a tight program.

EXPECT OPERATIONAL CAPABILITY WITH ICBM AND IRBM ABOUT SAME TIME

Senator SYMINGTON. Would it be fair to say that this program in your opinion is further ahead, so far as a practical weapon in quantity is concerned, than any other IRBM or ICBM program?

General SCHRIEVER. Well, there is no other ICBM program. I would say the Atlas program is ahead of the Martin program; yes.

Senator SYMINGTON. It is ahead of your IRBM program at Douglas?

General SCHRIEVER. We think we can reach an operational capability about as soon on the ICBM as the IRBM. (D)

Senator SYMINGTON. How about your position with respect to the Army-Navy Jupiter?

General SCHRIEVER. I have not seen their latest schedule actually.

I don't know when—I know when they plan their first development firing, so I would not want to comment on that.

Senator SYMINGTON. I think we have had some testimony on that but to be honest I forget the dates.

We have had a lot of testimony in the last few weeks.

Just one more question for clarification.

When did you say, based on the schedule of this ICBM Atlas, if everything goes as you hope, that you will have a hundred missiles that could be fired?

General SCHRIEVER. I will show you this in a moment.

Senator SYMINGTON. Does that come later?

General SCHRIEVER. Yes, sir.

It comes right away.

Senator SYMINGTON. Take your time.

General SCHRIEVER. I would like to, at this point, comment on the operational aspects because we are arriving at the operational capability in a slightly different way for this weapon than we have in the past for other weapons.

The Research and Development Command has been given the responsibility for achieving the initial operational capability, and I will explain what that is in a moment.

WORK VERY CLOSELY WITH SAC

Now we are working very, very closely with the Strategic Air Command. As a matter of fact, they have a liaison officer with us now and they plan to set a staff up with us on the west coast, so you might say we are working here on a definite team basis.

We have had a number of briefings with General LeMay and General Power, and we are right together on this. But since this is a completely new weapon that requires a new environment, it is dictated to a large extent by technical considerations, and ARDC has been given the responsibility to get this initial operational capability.

PLAN FOR OPERATIONAL INVENTORY

With that I would like to go into the buildup of this initial operational capability.

This red line merely indicates the accumulation of missiles produced for all purposes. This shows the allocation of these missiles to the various parts of the program. (D)

That is our objective, so we are proceeding with plans along those lines and trying to get the techniques and equipments to do it.

In order to save time, I could skip the Martin chart because it is just like this one.

Senator SYMINGTON. How long does your briefing go?

General SCHRIEVER. I am practically through.

TITAN ABOUT YEAR BEHIND ATLAS

Senator SYMINGTON. Well, let's go to the Martin chart then. We have plenty of time. We want to get the facts.

General SCHRIEVER. Here is the Martin chart.

The chart is again the same type of chart.

As you will notice, it is in practically all respects 1 year behind the Convair program as far as the development program here is concerned and as far as when we can release for production. (D)

Senator SYMINGTON. Off the record.

(Discussion off the record.)

Senator SYMINGTON. Back on the record.

Senator SALTONSTALL. Mr. Chairman, I regret I have to leave in 10 minutes to go before the Foreign Relations Committee.

May I ask an extraneous question?

Senator SYMINGTON. You ask anything you want.

Senator SALTONSTALL. Mr. Chairman, I would like to ask General Power this question—and I will say to the Chairman and Mr. Hamilton, put it in the record the way you see fit.

CAUSES OF ERRORS IN BOMB TESTS

General Power, you and I were out at Bikini in 1946, and we watched that bomb go down from the air and then you gave me a ride down afterward.

I would like to ask you this question, which has been worrying me a good deal as a layman.

Why was the error so great as is reported in this recent explosion out at Bikini? (D)

Was that a human error, or was it mechanical, or does the Air Force now admit that there was any error?

General POWER. At Bikini the error, and I ran the investigation on that, was due to poor ballistics of that bomb. We have improved that situation in the interim.

Senator SALTONSTALL. When you say "poor ballistics," what do you mean?

General POWER. Ballistic qualities of the bomb.

In other words, it did not fall in a true trajectory. It wobbled and swayed from side to side so that even though the sighting operation was correct, the bomb would not necessarily follow the intelligence that was put into the bombsight.

That created the error at Bikini. The error that occurred here recently was a human error.

Senator SALTONSTALL. The error that occurred then in this recent development was not through failure of any scientific knowledge?

General POWER. It was one of those things that happen when you have human beings in a system.

Senator SALTONSTALL. Well, you had the best trained crew you knew.

General POWER. Yes, sir, he forgot to turn a switch off. Basically it amounts to that. They make trial runs. As you recall, they make practice runs to make sure everything is set, and there was a switch that on the final run should have been turned off and he left it on. This put the error in. Completely human error. (D)

Senator SALTONSTALL. Would that be a fatal error at another time? I mean would that error lead to such a failure of accuracy that we would hit our own people or make an awful lot of trouble?

General POWER. Of course I was not out there and there is a report being made, but I would be glad to give my opinion.

In a bombing error of this type, the bombardier resets his cross hairs on the target. What you have is the erroneous drift information being put in, drift information from a previous run so that the error never could be very great because he has the cross hairs on but it is not synchronized properly. It is synchronized on the previous run, so it would always be of a small magnitude.

Senator SALTONSTALL. Thank you, Mr. Chairman.

Senator SYMINGTON. One thing that interested me in the question Senator Saltonstall asked; you have a school of people who talk about tactical utilization of nuclear weapons. If a fellow left off a couple of switches you would have quite a few apologies to make hitting a city instead of an airfield, wouldn't you? (D)

General POWER. Wherever you have human beings you have this type of accident. You have that in time of war, you bomb the wrong targets. I think in spite of all the safety factors you put in you will have this periodically. If you put too many safety factors in you start downgrading your performance just due to the safety factors.

Senator SALTONSTALL. Thank you very much.

Thank you, General Power.

General Schriever, I am awfully sorry I have to leave but the Foreign Relations Committee has orders that we have to follow.

(Senator Saltonstall left the room.)

Senator SYMINGTON. Senator Duff, any questions?

Senator DUFF. Not at this time.

Senator SYMINGTON. Will you proceed, General? (D)

OPTIMISTIC ABOUT SCHEDULES

You have given us your optimum analysis of when we go into production. Based on your experience do you think we can meet these schedules?

General SCHRIEVER. Based on my long past experience I would say that I would put a big question mark on it. There is no precedent for this program, but based on my confidence I think we will.

Senator SYMINGTON. In my opinion, from a practical standpoint you know at least as much as anybody else. Isn't that true, General Power?

General POWER. Absolutely.

Senator SYMINGTON. With that premise, we have had some optimum schedules given to us. From the limited knowledge I have in this field they are plenty optimistic. Some have been ahead of yours.

ATLAS IS OLDEST UNITED STATES LONG-RANGE BALLISTIC-MISSILE PROGRAM

The staff reminded me that the Atlas is the oldest program of all ballistic missiles, is it not?

General SCHRIEVER. Well, the Redstone, the shorter range missile, has been in—I don't know when they started that.

The ICBM if you start at the study period back in 1946, it would be the oldest.

Senator SYMINGTON. I think you have corrected me on the Redstone. I was not thinking of that. I was thinking of something with a range of a thousand miles or over.

General SCHRIEVER. Yes, sir, it is the oldest.

Senator SYMINGTON. Even this schedule which is very condensed, and on which you have the highest priority, everything has to go your way to meet it.

That is a fair statement; is it not?

SPEED OF PROGRAM

General SCHIEVER. This is right, and there is no question in our minds but that we will have the hardware available to test in accordance with our present schedule.

We know the problems on facilities, but we have got tremendous push going. We have approximately a $250-million R. and D. test facility program going right now, and, of course, we run into problems every day and we have to find ways to solve them, but we have maintained pretty well our schedules.

Senator SYMINGTON. As a result of the tremendous emphasis on the program that has been given it since late 1953 or early 1954, which I am sure we will all give Trevor Gardner credit for, having a great deal to do with it, as it is going now it is going about as fast as you think it can go; is that correct?

General SCHIEVER. In my opinion it is.

This completes the briefing part. We have taken much longer than I expected, so I don't know about the film.

General POWER. We have covered more ground than we had initially planned in this part of the briefing and some of the film may be redundant on this.

It depends on time; it is about a 30-minute film.

Senator SYMINGTON. We want to see it.

(At this point the film was shown to the committee.)

Senator SYMINGTON. That was certainly interesting.

General POWER. We felt that a picture would be very helpful in getting the feel of the problem.

Senator SYMINGTON. Especially that work on the nose cone.

Senator DUFF. General, you have given us some graphic pictures of the age of miracles apparently.

Senator SYMINGTON. Mr. Counsel, have you some questions?

Mr. HAMILTON. I have a few questions, General. (D)

QUESTION OF COST OF MISSILE PROGRAMS

What is it estimated that the 3 programs will cost with respect to the 3 missiles? Do you have an estimate on that?

General SCHRIEVER. No; I don't have an estimate at the moment for programing out the program that I indicated to you. (D)

We have just firmed up this program and we are in the process of costing it out at the moment.

Mr. HAMILTON. Do you have any estimate as to the order of magnitude of what an ICBM would cost once you get it in production?

General SCHRIEVER. Yes; and this would have to be a little bit rough at this time but it would certainly—the complete missile as an operational vehicle we believe is rather simple.

Mr. HAMILTON. That would be the ICBM or the IRBM?

General SCHRIEVER. IRBM would be considerably cheaper. (D)

TEST SITES

Mr. HAMILTON. Does the Air Force plan to have any test launching sites for the completed missile other than the one at Patrick?

General POWER. For tests only?

Mr. HAMILTON. Yes.

General POWER. For the ICBM Patrick is the only test range.

Mr. HAMILTON. And then will you test the IRBM there too?

General POWER. Yes.

Mr. HAMILTON. Will the Army and the Navy use the same launching site?

General POWER. Yes, their programs are integrated into the overall program at Patrick.

Mr. HAMILTON. So there will only be the one launching site to test all of these long-range ballistic missiles?

General POWER. That is right, to date.

It is my understanding that there are plans by the other two services for either extensions of present ranges or new ranges, but aimed primarily at their increased testing load that would come at some later stage.

Mr. HAMILTON. Then the moving picture that you showed us showed a number of other test sites but those were tests for various component parts, components of the missile?

General POWER. That is right, sir. (D)

Senator SYMINGTON. Senator Duff?

General Power, we have had testimony about the missile picture before. You mentioned here that you only have one launching site.

Isn't that going to be a problem from the standpoint of preparation and firing power?

General POWER. For the testing phase?

Senator SYMINGTON. Yes. This is for the testing phase.

General POWER. This will be very tight but we have gone into it very carefully with the other services, and we feel that we can support the program.

FIVE BALLISTIC MISSILE PROGRAMS

Senator SYMINGTON. We now have 4 projects as I understand it in this field, really 5.

You have the Redstone, the Jupiter, the Thor, the Titan, and the Atlas; is that about right?

General POWER. That is correct.

Senator SYMINGTON. Do you feel that you could get ahead quicker if you had less programs?

General POWER. I believe General Schriever brought a point out in his discussion that we could not actually point a finger to a particular spot that has slowed us down due to having all the programs.

However, it does increase the workload on the top management people at the range and in General Schriever's organization. Weighed against that, of course, would be the increased insurance of having alternate approaches.

NEW WEAPONS POINT TOWARD NEED FOR GREATER INTEGRATION

Senator SYMINGTON. The missile picture itself is going to automatically bring the various branches of the services closer together; wouldn't you say?

General POWER. In the missile field we work very closely together now.

Senator SYMINGTON. I mean you are going to have one weapon in effect that is going to be used by everybody; are you not?

General POWER. In my opinion this will create a problem that will have to be faced up to organizationally. I assume that is the point you were driving at.

Senator SYMINGTON. For the first time you have the same weapon—the missile—being of great interest to all three services.

It seems to me there has to be closer integration, and automatically there will be closer integration, as a result of everybody wanting to be in the missile picture.

General POWER. I agree that that is indicated.

Added to this is the quick reaction time that these missiles present and it would appear that organizationally there will have to be very close integration in order to maximize any particular potential you have. (D)

COORDINATION WITH OTHER SERVICES

Senator SYMINGTON. In your IRBM field you are working with the Navy?

General SCHRIEVER. Yes.

Senator SYMINGTON. Do you do that through the Army or do you do it direct?

General SCHRIEVER. No, both ways.

Actually Admiral Raborn and General Medaris and I form a coordination team.

We get together from time to time on problems, the three of us; we have on several occasions. These is a Navy liaison officer actually stationed at my headquarters, also an Army liaison officer.

Senator SYMINGTON. What are their ranks?

General SCHRIEVER. A commander and a lieutenant colonel.

SEA LAUNCHING OF MISSILES

Senator SYMINGTON. Certainly one of the most desirable launching platforms which we have would be from the sea.

Take some of these atomic submarines. I think the record shows, this was some time weeks back, they went 36,000 miles.

Captain, do you know how far it has gone now?

Captain SEARCY. It is approaching 50,000 miles.

Senator SYMINGTON. Without refueling?

CAPTAIN. Yes, sir.

Senator SYMINGTON. That is really something. Fifty as against 26. On the 36,000 figure, 20,000 was under water.

Captain SEARCY. Over half of the 36, yes, sir.

Senator SYMINGTON. Certainly at sea you have a wonderful opportunity to launch missiles from submarines or surface vessels.

You are working as close as you think you can.

General SCHRIEVER. With the Army and the Navy? There is always room for improvement. After all, we have not been at this very long and we have all been very busy. I have a liaison officer at Redstone and I think that our relationships are excellent, not that we don't hassle from time to time, and I think they will improve.

Senator SYMINGTON. How about the people, the top people who are capable of doing this type and character of work?

As you add specific programs, does that make it more difficult for you to keep the top talent on the job?

General SCHRIEVER. You mean through my organization or throughout the whole?

QUESTION OF DUPLICATION OF EFFORT AND SHORTAGE OF COMPETENT PERSONNEL

Senator SYMINGTON. I am thinking that there cannot be too many men around who know this type and character of work. I remember when the first gyro computers came in at the end of the last war there just were not enough people available to do the job. That is why we lost a good many airmen and I am sure some seamen, although the Navy originally developed battleship X, therefore got in at the beginning.

If you increase the number of jobs and programs, don't you attenuate considerably the people at the top that are capable of handling this kind of work?

General POWER. I think this goes right across the board and the answer is yes.

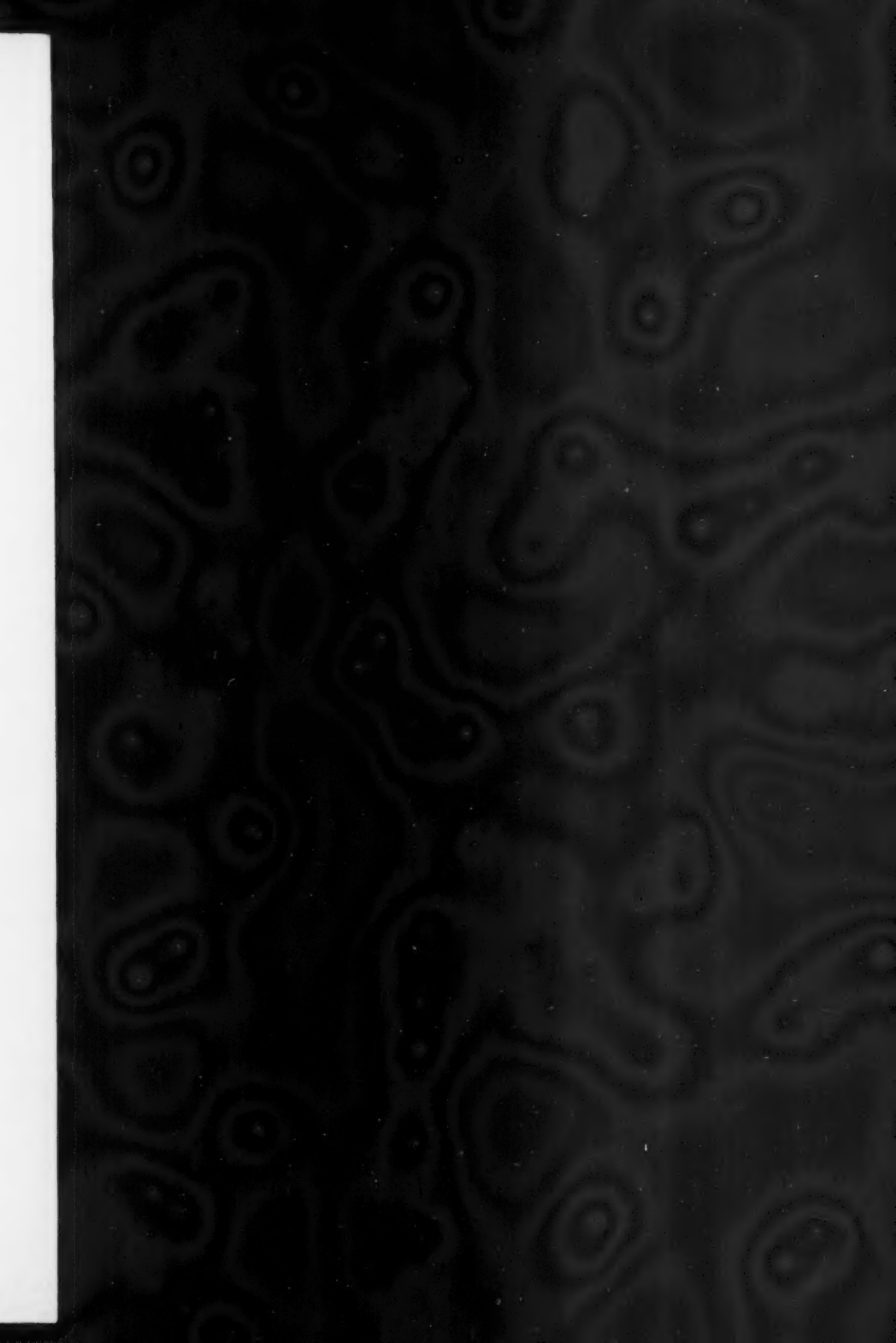
I am sure you are all familiar with the so-called shortage of engineers and the advertisements in the New York Times trying to hire engineers back and forth. As you create high priority programs and these companies do not have the working force in being, they have to hire them from someone else.

Now whether another high priority program suffers, or a lesser program, there is definitely a strain put on the whole system.

APPRECIATION

Senator SYMINGTON. General Power, we are very grateful to you and General Schriever and your staff for coming here and giving us this most instructive and informative briefing.

Thank you very much.

(Whereupon, at 12:15 p. m., the committee was adjourned.)

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